U.S. Department of Justice
Spatial Crime Analysis System

Users Guide

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I. OVERVIEW ***3***

What is the Spatial Crime Analysis System? **3**

Who is the Spatial Crime Analysis System for? **3**

What can I do with the Spatial Crime Analysis System? **3**

How does the Spatial Crime Analysis System work? **4**

Need more Help? **4**

II. BASICS ***5***

Learning ArcView **5**

Starting the Spatial Crime Analysis Application **5**

III. QUERIES ***6***

Submitting a basic query to the incident database **6**

Incident Query Form - Discussion **6**

Querying incidents of a specific class code **11**

Browsing the 'result' database **12**

Browse related suspect, victim, or vehicle information (Show Info) **13**

Creating a difference "Change" map **14**

Advanced Queries **19**

Selecting incidents only in a specific area **19**

Select Incidents by Roads **19**

Standard Deviation Ellipse Suspect tool **22**

IV. Maps and Analysis ***23***

Symbolizing and Labeling Map Features **23**

Classifying and Symbolizing the 'Result' Theme **23**

Making 3-D Pins **24**

Point Count **24**

Radius Summary Tool **25**

Point Count: Zoom to Address **26**

Labeling features on the map such as streets **28**

Changing the title of the map **28**

Customizing the symbols on the map **29**

Linkage and Measurement Tools **29**

Incident/Suspect Lines **29**

Length-Labeled Lines **30**

Hot-Spot Analysis **31**

Creating a 'hot-spot' map 31
Vectorize and Zoom to Hotspots 31
Standard Deviation Ellipses 32
HotSpot SDE's 34
Manual Geocoding 35
Geocode Remover 36
V. Creating Charts ***37***
Creating Temporal Trend Charts 37
Create Spatial Trend Chart 38
VI. Printing Maps and Reports ***41***
Printing a map 41
Standard Reports Generator 41
Beat Reports 43
Creating Crime Alerts 44
VII. Managing your work ***47***
Saving changes to a project 47
VIII. Glossary ***48***

I. OVERVIEW

What is the Spatial Crime Analysis System?

The Spatial Crime Analysis System (SCAS) is a collection of crime analysis tools developed with ArcView GIS and Visual Basic software. It is designed to aid crime analysts and police officers in the geographic analysis of crime incident databases. The SCAS includes the ability to assign a mappable coordinate to any address in the police jurisdiction (a process called geocoding). Every time an incident query is performed with SCAS, the resulting records are automatically geocoded and a basic map of the points is generated. SCAS includes a wide variety of functions for mapping and analyzing the resulting data, including creating colorful, easy to read layouts, charts, and reports.

Who is the Spatial Crime Analysis System for?

The Spatial Crime Analysis System is designed to assist crime analysts, managers, and officers in studying geographic and temporal trends in the occurrences of crimes.

What can I do with the Spatial Crime Analysis System?

Some of the basic mapping capabilities of SCAS include:

* Pin Maps (a dot for each reported incident).

* Graduated symbol maps (larger dots represent more incidents at a location).

* Incident Counts by polygon (Number of incidents per PRA, or beat, for example).

* Number of incidents in radius rings around a given point (100 incidents in ¼ mile radius, 200 in ½ mile).

* Change Maps (change in the number of incidents over a month or year period).

* Hot-Spots (Areas with the highest concentrations of incidents)

* Standard Deviation Ellipses (Ellipses calculated and drawn around the center of a cluster of incidents).

* Some of the basic graphing capabilities include:

    Temporal charts (charts the times that a group of incidents occurred)

    Spatial (charts by polygon, where incidents are occurring)

* The basic reporting capability includes the ability to produce incident-level reports detailing all incidents returned from the query. The reports will include both geocoded and ungeocoded incidents, with a geocode status flag.

How does the Spatial Crime Analysis System work?

The Spatial Crime Analysis System is based on ArcView (ESRI) and customized for crime analysis using Avenue, the ArcView programming language. Additional functions were added through the use of Visual Basic form menus.

Need more Help?

If you have questions or problems that cannot be resolved with the on-line documentation, please contact the U.S. Department of Justice, Criminal Division GIS Staff:

The GIS Staff e-mail address is criminal.gis@usdoj.gov

John DeVoe, GIS Staff Chief

David Nulph, GIS Application Developer, Indus Corporation

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II. BASICS

Learning ArcView

The best way to become proficient with ArcView is to take one of the ArcView training courses offered by ESRI. The US Department of Justice, Criminal Division GIS Staff strongly recommends ArcView training for anyone who plans on making extensive use of the Spatial Crime Analysis System.

The following materials are recommended as additional sources for ArcView help.

1. ArcView On-Line help. Access this by selecting the 'help' drop down menu from the menu bar in ArcView. This on-line help is particularly useful if you have a particular question or problem, as it is key-word searchable, and is organized by topics.

2. The ESRI document, provided with ArcView *Using ArcView GIS.* This document contains a brief tutorial and discusses all the major components of ArcView. It is ideal for someone who is learning ArcView.

Starting the Spatial Crime Analysis Application

There are two ways to start SCAS:

1. Double click on the SCAS Icon. This will start a new SCAS project.

- OR -

1. Start ArcView

2. Open an existing SCAS project (.apr) file that you have previously saved.

The Spatial Crime Analysis System will display a Signon Screen. Enter your name and press <enter> to continue.

III. QUERIES

Submitting a basic query to the incident database

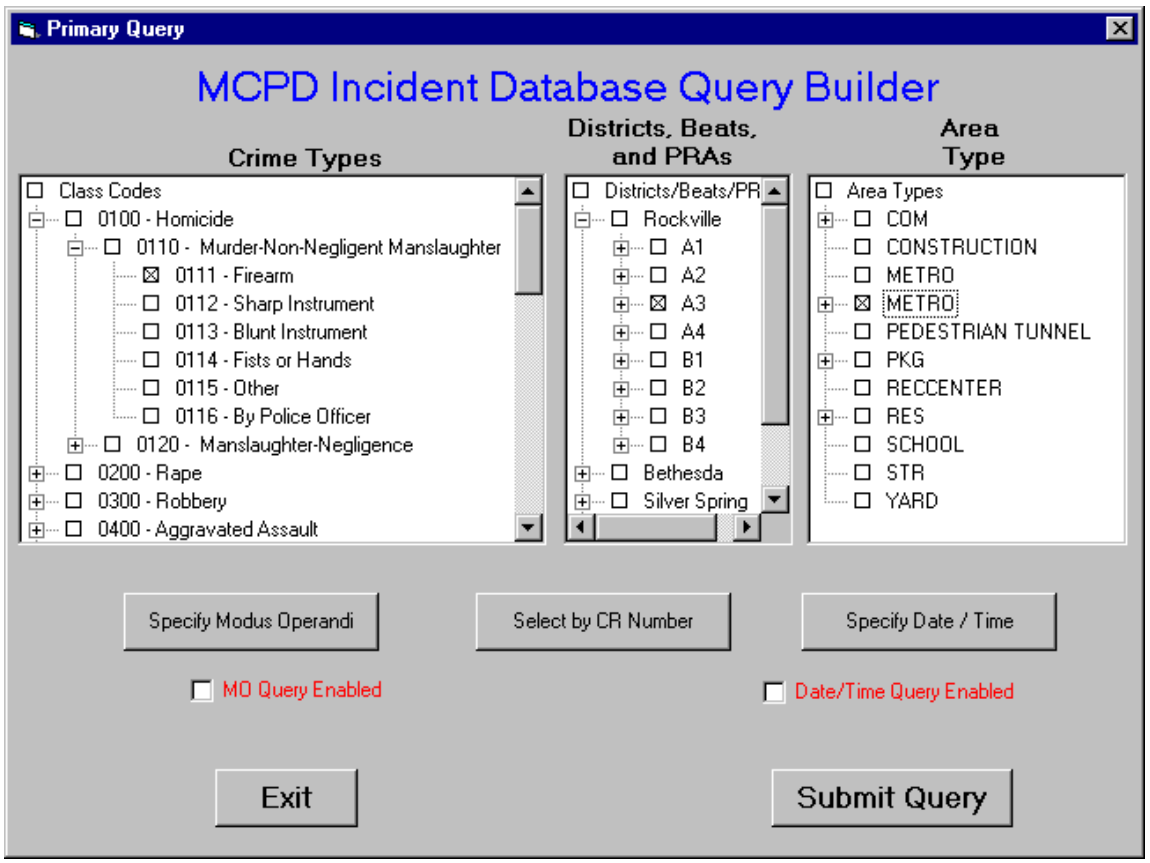
1. Start the Spatial Crime Analysis System.

2. Make the 'SCAS View' the active window.

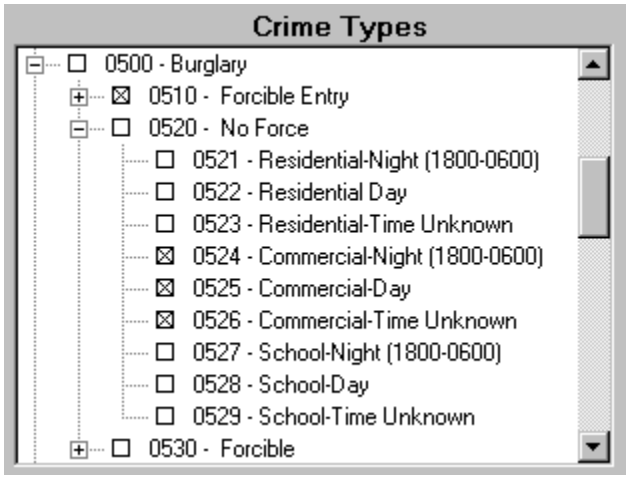
3. Click on the 'incident-query' button.

This will activate the incident query form menu. By filling out the appropriate sections of the form, you will specify the exact results that you wish to map. For example, by checking boxes in the Class Code hierarchical menu, you can specify specific crime types. To restrict the date period that you are interested in, select the 'date' button, which will start the date selection sub-menu.

Incident Query Form - Discussion



The custom query dialog allows you to search the incident database on a number of different parameters: the type of crime, the district or beat in which it occurred, the type of area type in which it occurred (school, business, residential, etc.), the time and date at which the incident took place, and three different *modus operandi* classifications. Each one of these parameters is optional, but the incidents returned by your query will each have **all** of the attributes that you specify. This guide explains each item on the Incident Database Query Builder, and then explains how to operate the two sub-menus which can be reached from this form.



CRIME TYPES:

The crime codes are organized in a hierarchy, and are presented in a collapsible tree.

Each line in this tree will have one or two small boxes on the left side. The expansion button, if it is shown, will always have either a "+" or a "-" in it. If the "+" is shown, the class code on that line has children which may be displayed by clicking on the expansion button. If the box has a "-" in it, the immediate subcategories of the current class are already displayed; they may be hidden by clicking the expansion button. Hiding the subcategories does not alter their selection status. The selection indicator, which appears immediately next to the crime code and its description, will have an "x" in it if the code has been selected to include in the query. If there is no "x" in the box, the database will not be searched for that crime code.

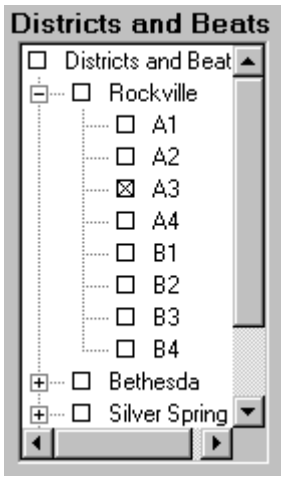
When the query screen first appears, the first level of the hierarchy, containing values like "0100 - Homicide" and "5000 - Traffic Accidents" are exposed.

If you would like to search for a crime in a broad category such as this, simply single-click on the line containing the code in which you are interested. If you need to expand the tree further, simply click one of the expansion boxes to see subcategories.. You may select multiple categories for searching. In the example image above, the database will be searched for crimes that have been coded 0510 (Burglary/Forcible Entry), 0524 (Burglary/No Force/Commercial-Night), 0525 (Burglary/No Force/Commercial-Day), and 0526 (Burglary/No Force/Commercial-Unknown).

Because the class codes are arranged hierarchically, selecting a parent code will ensure that all children of that code will be included in the search. For instance, by selecting 0510, (Burglary/Forcible Entry), incidents which have been classified as 0511 to 0519 will also be found by this query.

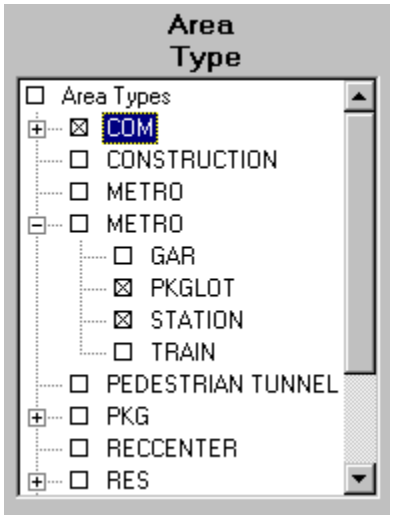
In other words, you do not need to select children of a selected entry in the hierarchy (though this will not harm the query). For instance, selecting 0100 means that any crime code that begins

with the numbers “01” will be found by your search, so there is no need to expand 0100 and select 0111 in addition to 0100. By the same token, though, if all you’re looking for are the 0111 crimes, than you should ensure that 0100 is not also selected!



DISTRICTS AND BEATS:

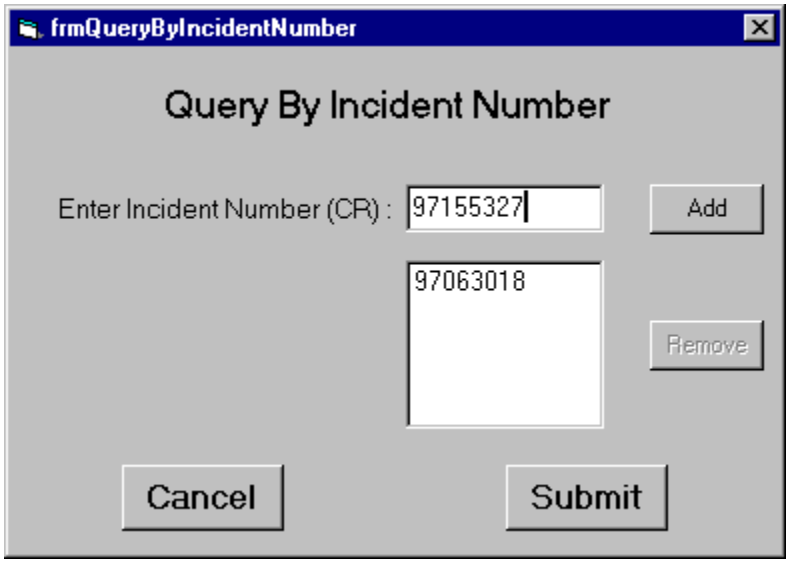
The tree display for districts and beats works in the same way as the tree for crime codes; select a district or beat by clicking on its selection box, or click on the expansion box to view a branch’s children. The districts are listed by name, and their corresponding beats are listed below them. You may search on either particular districts or the individual beats within them, and again you may select multiple areas in which to search (for instance, you might specify Beat A1 (which is in the Rockville district) as well as the entire Bethesda district in a single query.)



AREA TYPE:

The *Area Type* menu also works similarly to the *Crime Type* and *Districts and Beats* menus, in that each line features a selection box. The sample query above will find incidents where the

location has been coded as commercial, as well as the Metro sub-categories of parking lot and station.



CR:

Rather than use the main querying options, the database can also be queried for specific CR numbers. Clicking the "Select by CR" number will display the menu seen above. The user may type in the specific CR numbers desired, followed by the return key or clicking the "Add "button after each entry. As CR numbers are typed into the entry box, they will be added to the list below. CR numbers can be removed from the selection list by first clicking them with the left mouse button such that they are highlighted in blue, and then clicking the "Remove" button.

When the full list of desired CRs has been entered, click "Submit" to perform the query.

To exit back to the main query window, select "Cancel".

SPECIFY DATE / TIME:

Clicking the *Specify Date / Time* button will call up a secondary menu, labeled *Date & Time*. This menu can be used to restrict the database search to incidents which occurred on a particular date, within a particular range of dates, or within a certain time frame. Below the *Specify Date / Time* is a checkbox which indicates whether or not a date and/or time is part of the current query. If you set a date and then decide you would rather not query on it, simply click this check box so that it is not checked, and the date will be left out.

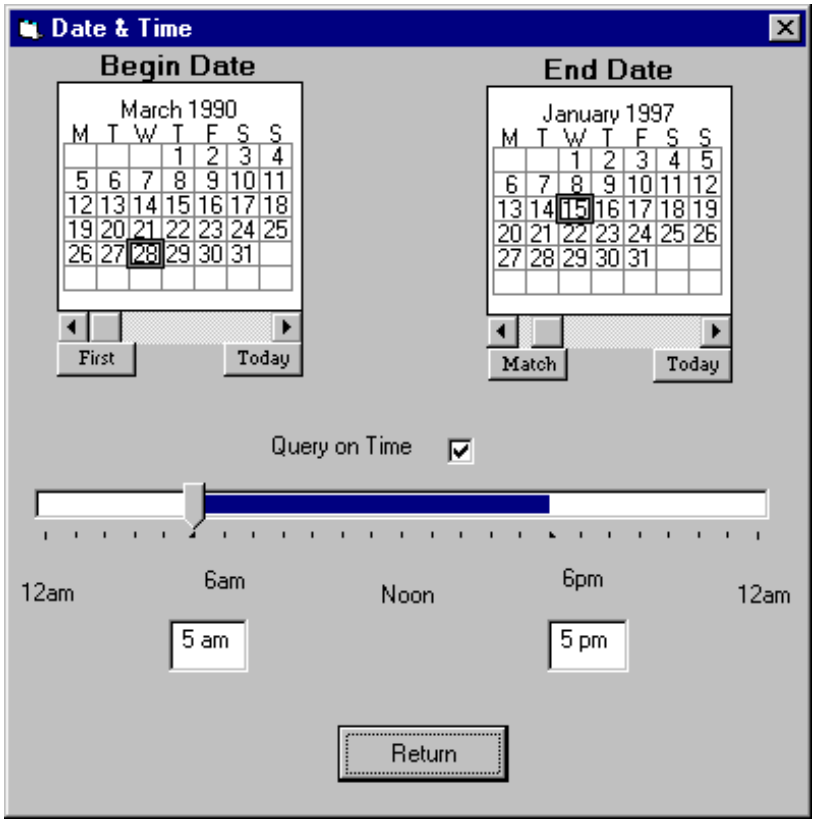
SPECIFY MODUS OPERANDI:

Clicking the *Specify Modus Operandi* button also calls up a secondary menu, *Select MO*, which allows you to specify three different varieties of MO for your query. Again, like the *Specify Date / Time* option, there is a checkbox to toggle whether or not the MO portion of your query is used. If you select an MO, this checkbox will be highlighted; if you then decide not to include MO as part of your query, you may uncheck this box (with a single left-button mouse click).

SUBMIT QUERY:

Once you've finished specifying the details of your query, click the "Submit" button. The query menu will disappear, and the SCAS window will return to the top. After a brief wait, you will be presented with a dialog box asking if you'd like to summarize the returned dataset by a polygonal region such as District or Beat. You may either select one of these or select "<None>." The map display will then redraw with the results of your query.

Submenus



DATE & TIME:

The Date & Time menu features two calendars which can be used to specify a date or range of dates, as well as a slider bar which can be used to specify a particular hour or range of hours.

The calendars are fairly straightforward; select a date within the currently displayed month by clicking on that date. For a rapid change of dates (on the order of years), drag the handle in the slider bar at the bottom of the calendar. The calendar may be adjusted by single years by clicking in the light gray space on either side of the slider handle. To increase or decrease the month by one, click the arrows at the bottom of the calendar. Three shortcuts are provided. The "First" button will set the calendar to the earliest date in the database. This may cause a short pause as the program queries the database to determine the earliest incident. The "Today"

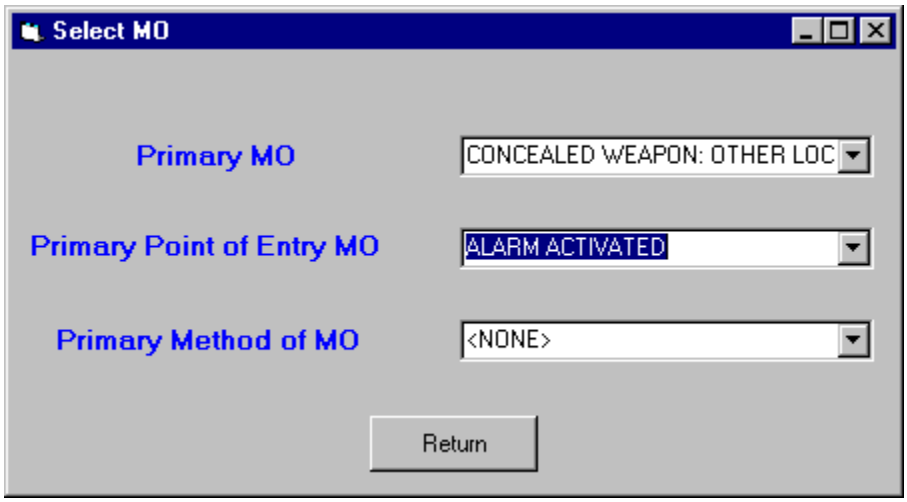
button will set the calendar to the current date at the time of use. Of course, your computer's date must be accurate for this to work! Finally, the "Match" button on the *End Date* calendar will set the end date to match the *Begin Date*. This is useful if you'd like to search a single day.

Below the calendars is a check box marked "Query on Time." If you would like to search for incidents which occurred at a particular time, you must first put a check in this box. You may then operate the time slider bar. A single handle is available in this slider bar. Drag it to the left or right by positioning the mouse cursor over the handle, holding down the left mouse button, and moving the mouse to the left or right. By setting the handle over a particular hour, you can search the database for incidents which occurred within the hour starting at the time you've selected.

If you would like to select a range of hours, you can set the lower end of the range as described above. To set the upper end of the range, hold down the shift key and once again drag the handle to the right or left. You may need to press, release, and press the shift key the first time you try to adjust the upper end of the hour range.

Note that it is currently impossible to select hour ranges which span midnight (such as 10pm - 2am).

Clicking the *Return* button will return you to the main query screen



SELECT MO

The Select MO button features three drop-down menus of *modus operandi* choices. To select an entry, click the arrow to the left of the box you would like to fill. A list with a scrollbar will appear; scroll through the list until you find the entry you want, then click that entry with the mouse button. You may set any or all of the 3 types of MO. Click the Return button to return to the main query builder screen. You may decide to disregard any MO settings from the main query builder screen by ensuring that the "MO Query Enabled" checkbox is unchecked.

Querying incidents of a specific class code

1. Make the 'SCAS View' the active window.

2. Click on the 'custom-query' button.

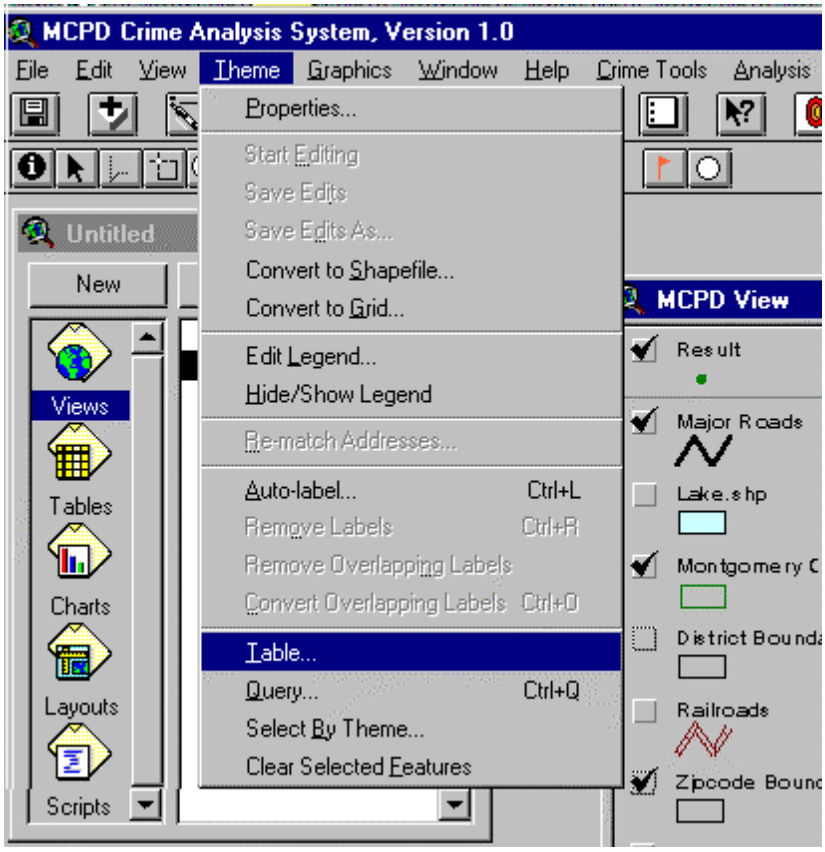
See detailed discussion of the incident query menu for a detailed explanation of using the incident query form

Browsing the 'result' database

The tabular contents of any theme, including the 'result' theme can be viewed by:

1. Make the desired theme active (in the view) window.

2. Select theme…table from the menu.



The table for that theme will appear. Records which have been selected will be yellow. You can group all of the selected records together at the top of the table by selecting 'Table…Promote' from the menu.

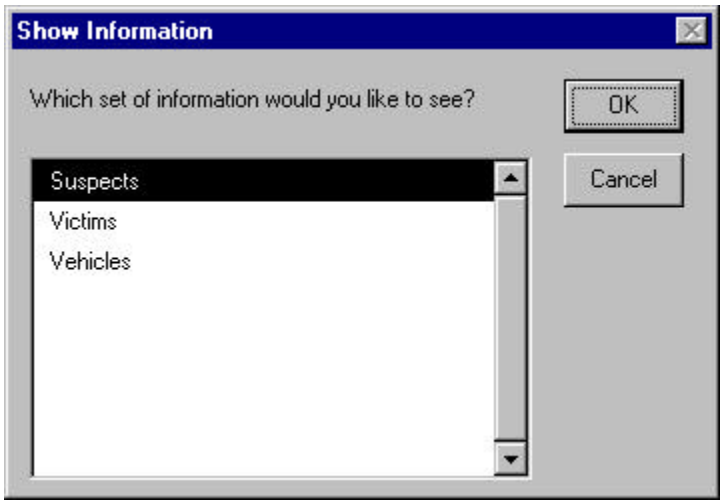
Browse related suspect, victim, or vehicle information (Show Info)

Steps:

1. Make a Result, Suspects, or Recovered Vehicles theme or table active.

2. Click the Show Info button. 

3. If the theme or table is a Result set, you will be asked whether you wish to see victim, vehicle, or suspect information.



Details:

The Show Info tool is used to create a table of additional information regarding incidents, suspects, or vehicles, based on an active theme or table. Its operation varies based on the active theme or table.

From within the main SCAS View:

The Show Info button will only be enabled if there is a single active theme. That single active theme's name must include "Result," "Suspects", or "Recovered Vehicles." If the theme is named Suspects, the resulting table will contain information about any suspects related to the crimes which were used to generate the Suspects theme. Likewise, "Recovered Vehicles" will pull up any vehicle information for the set of crimes used to generate the theme.

In both of these cases, it is important to note that the Suspect Information or Vehicle Information may contain a larger number of records than the theme which generated them. This is because the Suspects and Recovered Vehicles tables are based on those records for which there is locational information available (for instance, the location at which a vehicle was recovered, or a suspect's home address). The Information tables, however, will also contain information for vehicles or suspects for which there is no locational information.

If your active theme is a Result theme, clicking Show Info will first bring up a dialog box asking whether you'd like to see victim, vehicle, or suspect information.

The Show Info tool works much the same way from the Table interface; its action will vary based on the name of the active table, and the new table created will have the characteristics described above.

Creating a difference "Change" map

For an in-depth discussion of change maps, see 'Detailed Discussion' in the next section.

1. Make the 'SCAS View' the active window.

2. Click on the 'difference map' button. This will start the 'Change Analysis Tool' menu

3. Check either 'month', 'year', or 'week' button in the 'Pick a Date Period to Compare' section.

CAUTION: Performing a change comparison map on a 'year' time period may be very slow due to the large number of records that will require processing. This entire process may take as long as 20 minutes.

4. Select a year and month (for month comparison) from the 1st period drop-down menus, then select a year and month (for month comparison) from the 2nd period drop-down menus.

5. The crime type classifcation that is compared can be specified using the 'crime type' checkboxes.

6. When finished, click the 'Submit' button. The Spatial Crime Analysis System will the perform the necessary queries and processing to produce a map containing the difference in incidents between the two time periods.

WARNING ABOUT 'CHANGE' MAPS

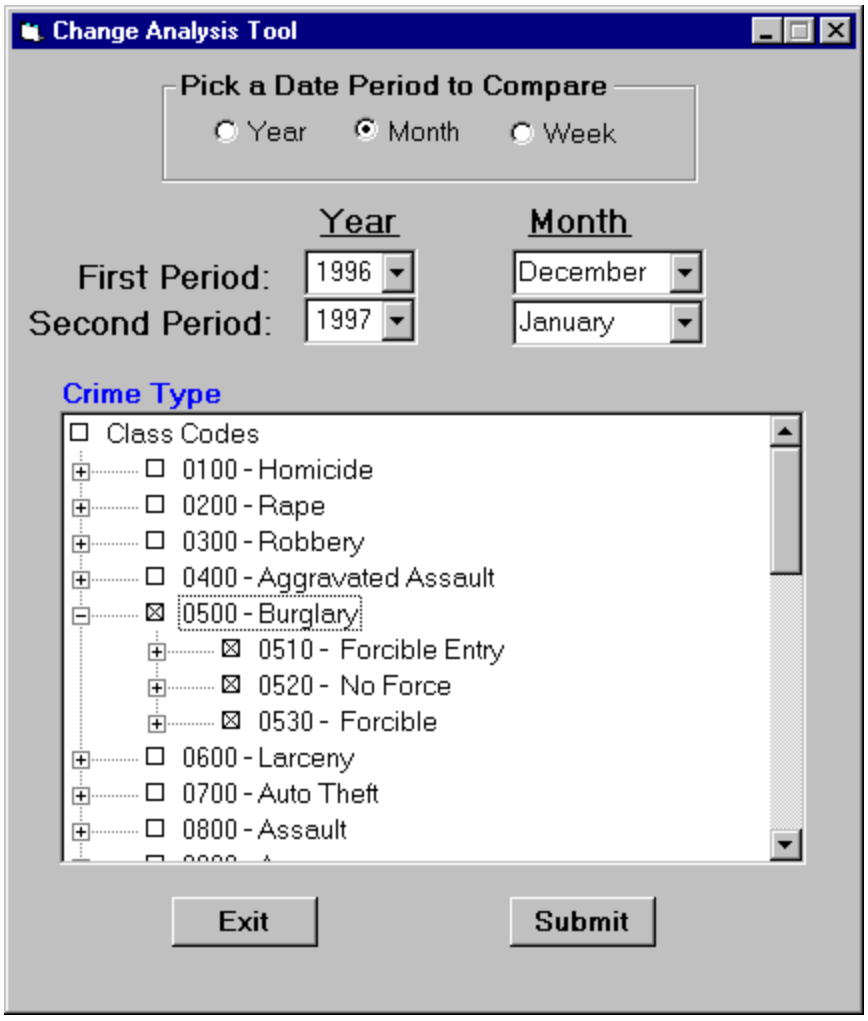
Producing a change map counts the number of incidents occurring in a polygon such as a PRA boundary or beat. The way SCAS makes the determination of which polygon an incident is in is by geocoding it, then spatially determining which polygon the incident location falls into. This makes these type of comparison maps dependent on the consistency of the incident record geocoding process. A sharp increase or decrease in the geocoding rate of the database (which could occur with new data entry personnel, or new street addresses unrepresented in the geographic street file) will appear as an increase or decrease in incidents on the change map.

Results of change maps should be used with caution, If a change map produces unexpected results, check the geocode rate of each time period by running an individual incident query for that time period.

Difference Map - Detailed Discussion

This section discusses in detail the difference 'change' map analysis tool

Change Analysis Tool -- the Difference Mapper



Suppose you want to know how crime has increased or decreased between 1994 and 1995 in each of the county's districts? Or how the number of rapes has changed between April and March of 1996 in each beat? The Change Analysis Tool is designed to do just that.

The Change Analysis Tool allows the user to create a map showing the positive or negative change in the amount of crime within an area between two time periods. The user-specified time period may be a week, a month, or a year, and the user may also select one or more types of crimes to summarize.

The example above represents a query to map the differences in the number of burglaries in January of 1992 as compared to those in January of 1991. Whether the change per area is calculated for beats, PRAs, districts, or some other type of area is selected from a separate dialog box within ArcView/SCAS.

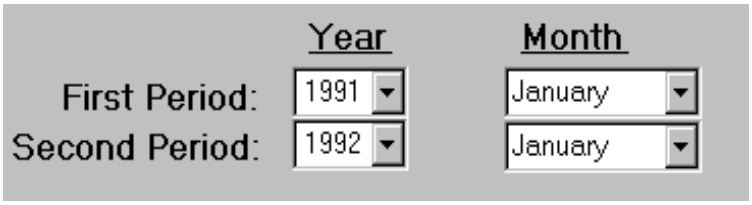
PICK A DATE PERIOD TO COMPARE:

Within the Change Analysis Tool, you may compare years, months, or weeks. Years are defined as January 1st through December 31st. Months begin on the 1st and end on the last day of the given month. Weeks may begin on any specified day.

You may select only one date period to compare.

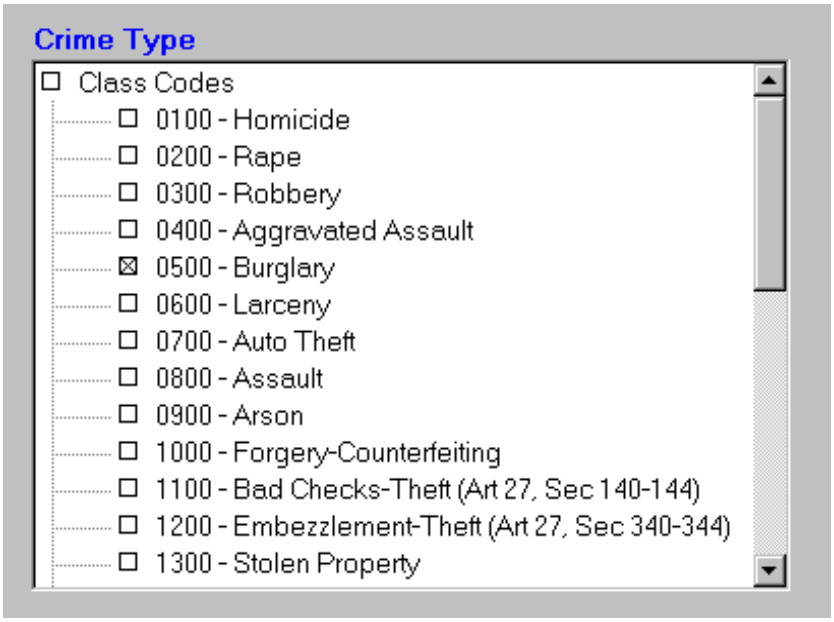
If you select "Week," the menu will expand to offer you more choices about the periods to compare.

YEAR / MONTH:



The year and month selectors are used if the date period to compare is set to month. Clicking the down-pointing arrow next to the box you would like to adjust will produce a list of valid years or months you may select. The first and second periods must be different or you will receive an error when you submit your query.

If your range to compare is "Year," only the year boxes will be active and the month selectors will be grayed out.



CRIME TYPE:

A crime class code hierarchy is provided so you may select categories and subcategories of crimes to examine. To select a crime class, simply click in the little box to the left of the code you desire.

The crime codes are organized in a hierarchy, and are presented in a collapsible tree.

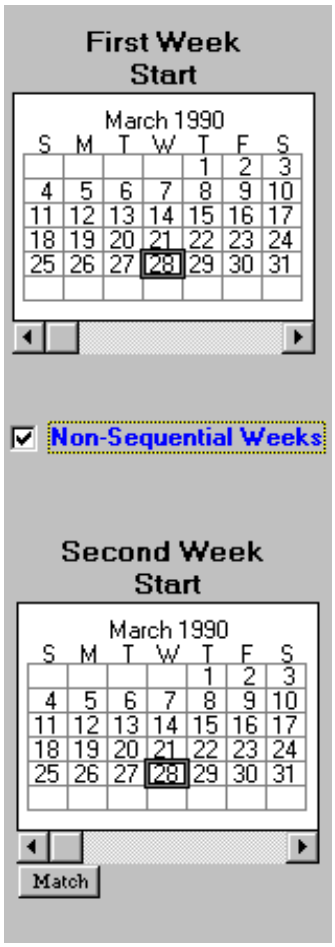
Each line in this tree will have one or two small boxes on the left side. The expansion button, if it is shown, will always have either a "+" or a "-" in it. If the "+" is shown, the class code on that line has children which may be displayed by clicking on the expansion button. If the box has a "-" in it, the immediate subcategories of the current class are already displayed; they may be hidden by clicking the expansion button. Hiding the subcategories does not alter their selection status. The selection indicator, which appears immediately next to the crime code and its description, will have an "x" in it if the code has been selected to include in the query. If there is no "x" in the box, the database will not be searched for that crime code.
You may select as many codes as you wish; the example above has only one class, "Burglary," selected. If no crimes are selected, the database will be searched for all incidents.

START DATE – SEQUENTIAL WEEKS:

If you have selected "Week" as your period to compare, the dialog box will expand to show the "Start Date" calendar which can be used to query on a pair of sequential weeks. The first week will start on the day you select and the second week will begin 8 days later. Thus, in the example above, the first week begins on March 28, 1990, and continues through April 3, 1990. The second week would then be April 4, 1990 through April 10, 1990.

You may select a visible date by positioning the mouse cursor over the number and clicking the left mouse button. You can change the month/year by dragging the handle in the slider bar below the calendar. You may also increase or decrease the year by clicking in the light gray portion on either side of the slider handle, or increase/decrease the month by clicking on the arrows at either side of the slider bar.

If you would rather examine non-sequential weeks (for instance, the same week-long period in two separate years, or the first week of two different months in the same year), click the white box next to the label "Non-Sequential Weeks."



A second calendar will appear below the existing calendar. Use the top calendar to enter the first day of the first week, and the bottom calendar to enter the first day of the second week. A "match" button has been provided which will set the second calendar to the same date as the first calendar. This is useful if you want to set the second calendar to have a start date near that of the first calendar. For instance, if you would like to look at the first week of April in 1994 and 1995, you can set the first calendar to April 1, 1994, then click the match button in the second calendar, and finally, click the gray area to the right of the slider bar handle on the second calendar. With just two mouse clicks, you have set the second calendar to be exactly one year ahead of the first calendar!

RETURN TO SCAS:

Once you have finished specifying your query, click "Submit" to have the SCAS search the database for incidents which match your query. If any records are found, you will be asked to choose a type of region (such as beat or district) for which to calculate change in number of incidents.

If you would rather quit the Change Analysis Tool without creating a map, simply click the "Exit" button.

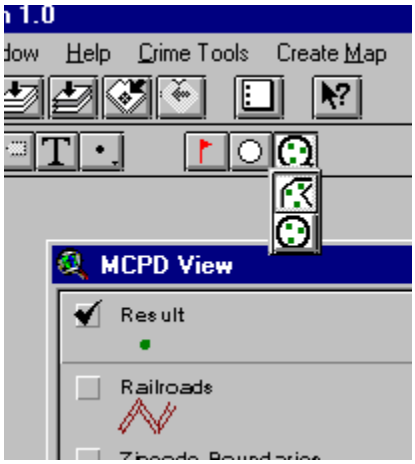
Advanced Queries

Selecting incidents only in a specific area

There are two tools which permit the selection of incident points in specific areas: Select by Circle and Select by Poly. These tools work by first requiring that a circle or polygon be drawn on the view. As soon is the reselect shape is drawn, the 'Primary Query' form will be displayed to allow refining the query even further. The resulting points will be the points that satisfy the query defined in primary query and that are within the polygon or circle defined.

1. Make sure the 'Result' theme is the active theme in the view.

2. Select the Select by Poly or Select by Circle tool from the View toolbar.



3. Draw the shape in the view window by pointing the mouse. To finish a polygon, double click the mouse.

4. The primary query window will now appear, you can refine the query or press the 'Submit Query' button to select all the incidents that fall within the polygon that you drew.

Select Incidents by Roads

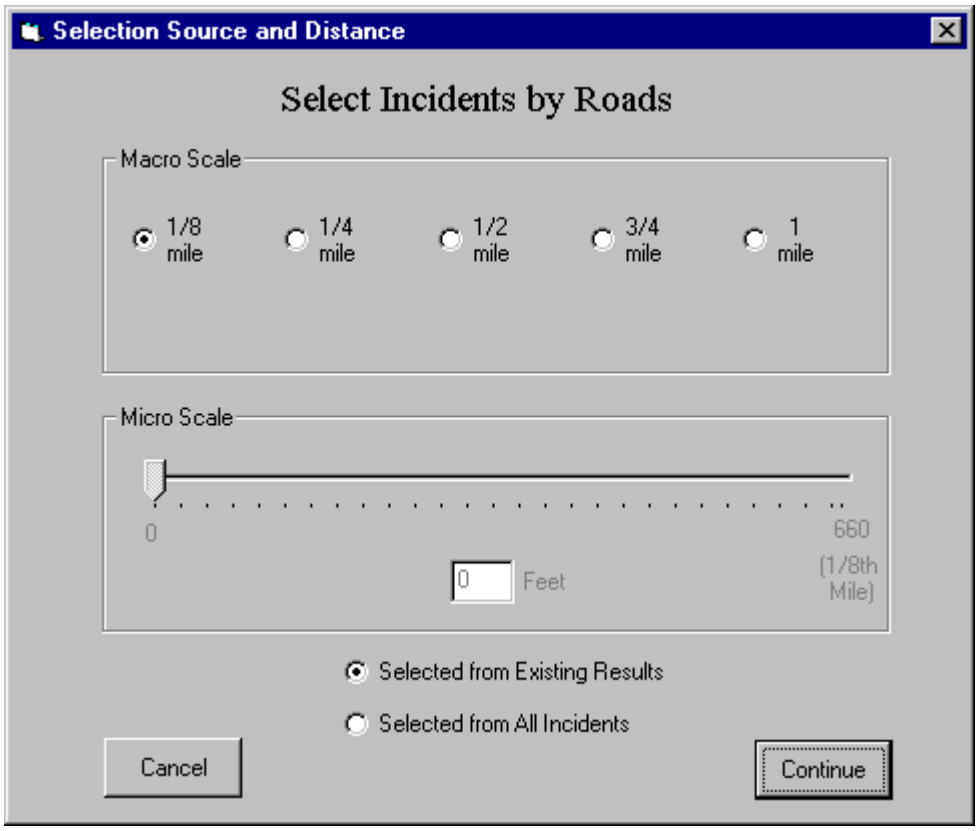
This tool's operation varies greatly based on the status of several things within the main SCAS view window. For a more complete explanation of how this tool works, particularly step 1, it is recommended that you read the detailed description of the tool.

Steps:

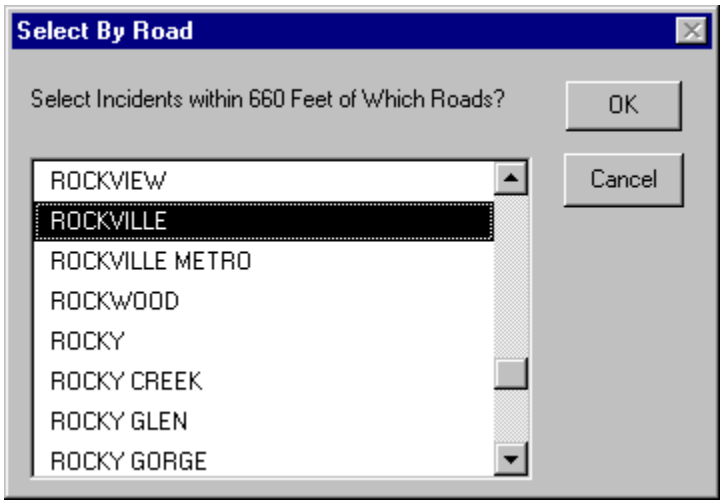
1. a) run an incident query and/or
   b) select some roads from the **Road** theme and/or

c) select some roads from the **Major Roads** theme or
d) none of the above

2. The Selection Source and Distance dialog will appear, allowing you to specify the distance from roads you'd like to search. You may also specify whether to search an existing Result (or other point theme) or whether to query the entire database.



3. If you did not select any roads in the **Road** or **Major Roads** themes (1b or 1c), you will be presented with a dialog box of available road names, from which you may select one or more roads.



Details:

The Select Incidents By Roads tool has a number of different options to allow the user to select a set of incident locations based on road features.

There are two basic ways to select the roads along which you'd like to search. The first is to make either the **Major Roads** or the **Road** theme (or both) active. Then use the ArcView Select Features tool to select the road features to be searched. Only those highlighted roads will be used in the query.

If you'd rather select roads by name rather than by clicking on the line segments, you have two choices. You can either open a table for the **Major Roads** or the **Road** theme and use the ArcView Query Builder to select your roads. Or you can simply make sure that neither **Major Roads** nor the **Road** theme has any selected features. In this last situation, you will be presented with a dialog box listing every road name in the county. Select as many names as you'd like (hold down the shift-key whilst left-clicking a road name in order to select more than one), then click Okay.

Whichever method you use to pick your roads, you'll be presented with a dialog box like the one above, which will allow you to specify how far away from the roads you'd like to search. The top of the box features a set of small-scale distances, ranging from 1/8th to 1 mile. If you'd rather search a smaller area, click in the "Micro Scale" box. This will enable the scroll bar which you can use to select a number of feet within which to search. This may be set anywhere from 0 to 660' (1/8th mile).

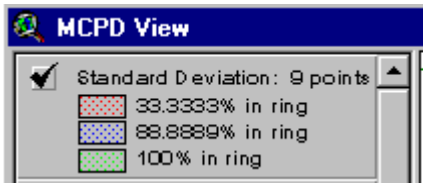
Once you've selected your distance buffer, you'll also need to specify whether to search all incidents, or only those within an existing Result theme.

At this time, it is not possible to define your query with the Incident Query Builder after selecting the Select Incidents by Roads tool, so if you wish to search for, say, auto thefts within one mile of Rockville Pike, the chain of steps to follow would be to start with a Custom Query for auto thefts (cod e 0711). Once that Result theme has been created, make it the only active theme, then click *Select Incidents By Roads*. Choose the appropriate road names ("Rockville", "355", "Wisconsin", etc.), and then choose the '1 mile' button and the "Selected from Existing Results" options in the Road Selection dialog box.

Standard Deviation Ellipse Suspect tool

Steps:

1. Make a Standard Deviation Ellipse theme active.



2. Select the SDE Suspects button. 

Details:

Given that you have already generated a set of SDEs for a result set, if that SDE theme is the only active theme, the SDE Suspects button will be available. When you click this button, the database will be searched for any known suspect locations (lives, frequents, works) which fall within the standard deviation rings.

When you click the button, you'll be shown a dialog box listing the rings available. Highlight those in which you'd like to search for suspects, then click Okay. If there is any suspect location information in the area selected, a Suspects theme will be created.

As currently written, this tool will not limit the search for suspects in anyway, meaning that *all* suspect locations within the selected rings will be returned; further querying of the new suspect theme will be necessary.

IV. Maps and Analysis

Symbolizing and Labeling Map Features

Classifying and Symbolizing the 'Result' Theme

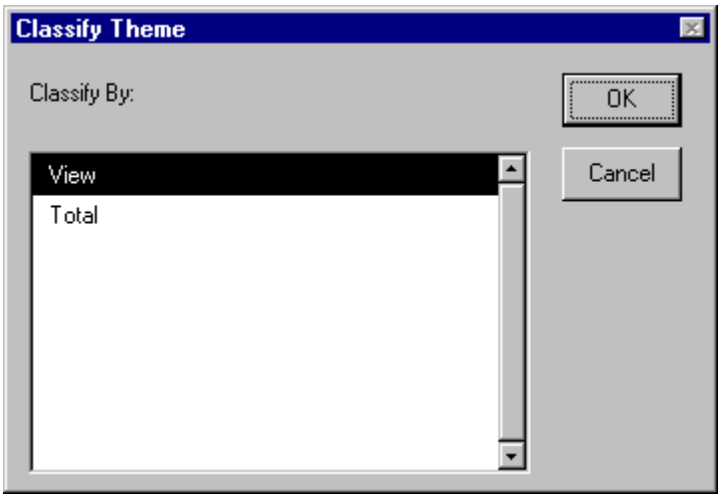
The classify theme tool classifies each incident by its crime class code and counts the number of incidents within the whole theme or the points of the active theme within the view. Select 'Unclassify Theme' from the 'Crime Tools' menu to return to a normal point theme.

1. Make the 'SCAS View' the active window

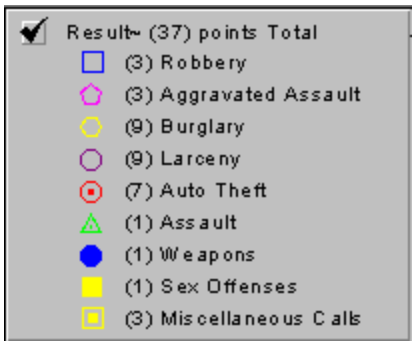
2. Make a point theme active, i.e. Result

3. From the 'Crime Tools' pull-down menu select 'Classify Theme'

4. Select which part you wish to classify
   - Select View to classify all the geocoded points within the SCAS View.
   - Select Total to classify all the points and ungeocoded points within the active theme.



5. The result is a classified theme in SCAS View. To return to a normal point theme select 'Unclassify Theme' from the 'Crime Tools' pull-down menu.



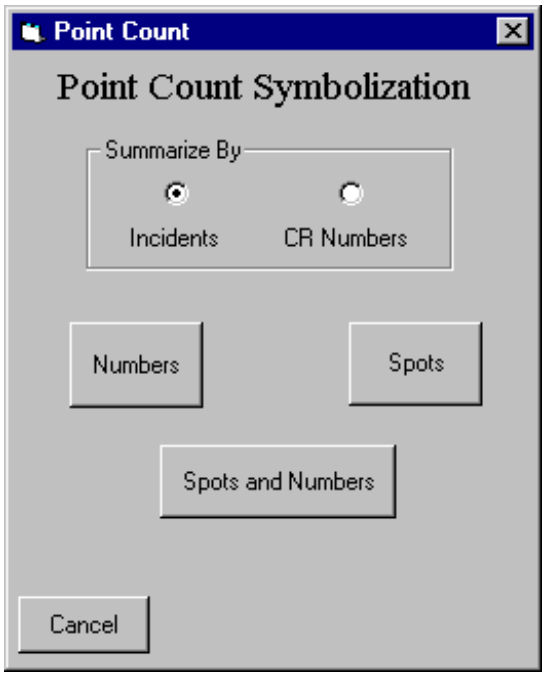
Making 3-D Pins

Point symbols resembling 3-D pins with shadows can be easily created using the 'Create Pins' function under the View menu 'Crime Tools'. The pins can be removed and turned back to normal colored dot symbols with the 'Remove Pins' function.

1. Make sure the theme to create the pins for is active.

2. Choose 'Create Pins' from the Crime Tools menu.

Point Count



Steps:

1. Make a Result theme active; only one theme may be active.

2. The Point Count menu will appear. If you wish to change the summary option from its default of “Incidents”, click on the circle above the option you’d like.

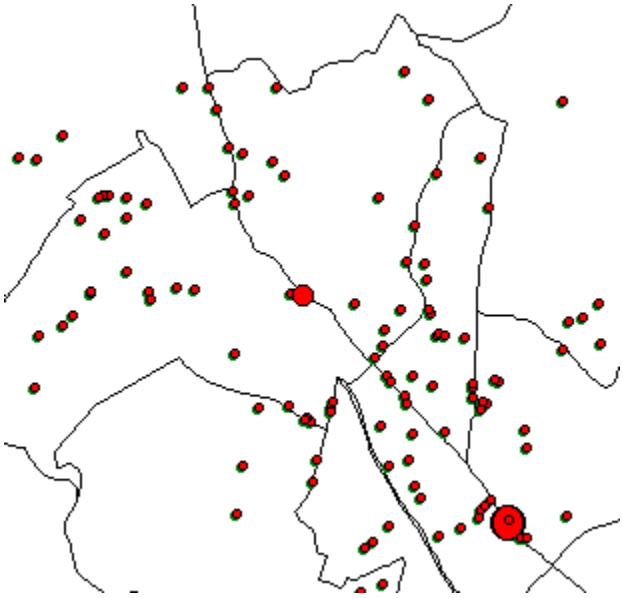
3. Select a symbolization option by clicking one of the three symbolization buttons with the mouse left button. The menu will disappear and after a brief delay, the point count theme will be created.

Details:

The Point Count tool allows you to view a map which summarizes the number of crimes that has taken place at each address included. The data may be displayed as numeric values, circles whose size vary with the count calculated for an address (low count = small spot / high count = large spot).

The data may be summarized by either incident or CR number. In the case of incidents, the count represents each individual victim/incident pairing that occurred at an address. For instance, imagine a crime that takes place in an apartment building, where several residents are victimized. This crime would have a single CR number assigned, but will be mapped by SCAS as multiple points at the same location on the map. Choosing the “Incidents” summary option will base the count at an address on each individual victim.

The “CR Numbers” option, on the other hand, counts the number of CRs which have an incident at a given location, with no regard for how many people were victimized at that location. In this case, imagine a convenience store which has been robbed on three separate occasions by different people. With the “CR Numbers” option selected, this address will have a count of three.

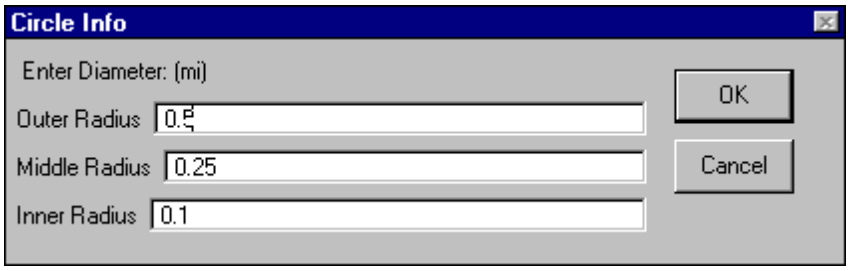


Radius Summary Tool

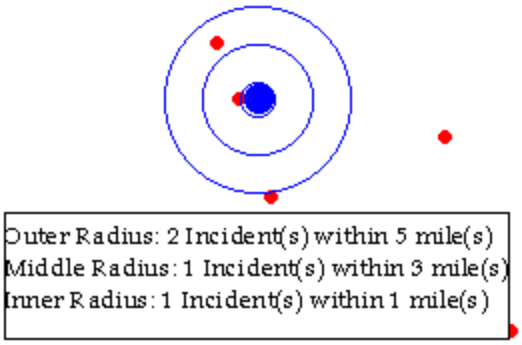
The Radius Summary Tool creates three concentric circles by user-defined radii and counts the number of incidents within each circle for the active point theme.

Steps:

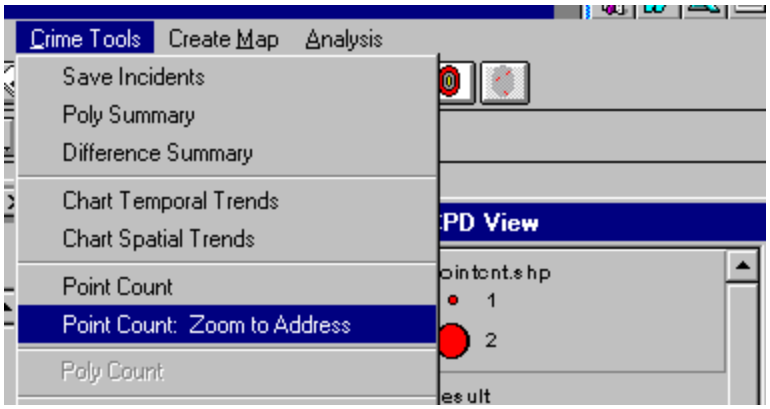
1. Make the 'SCAS View' the active window
2. Make a point theme active, i.e. Result
3. Select the Radius Summary Tool 
4. Select a location within SCAS View
5. Enter the radii for the three circles.



6. Three concentric circles will appear within the view at the user-defined radii.



Point Count: Zoom to Address



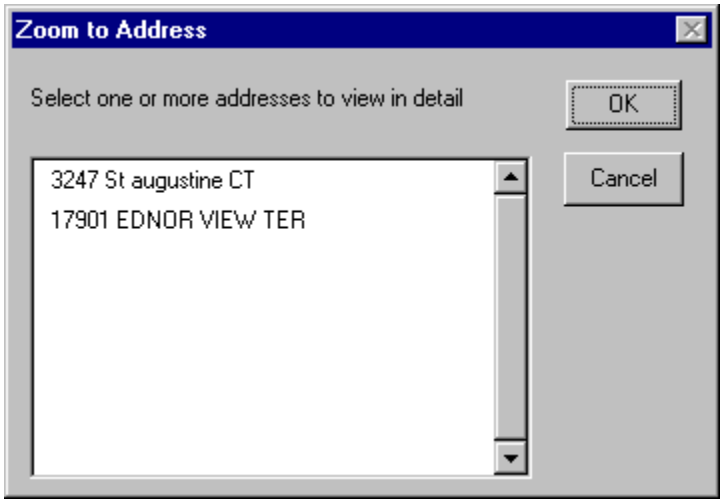
Steps:

1. Run a Point Count operation on a Result theme.

2. Make the new pointcnt.shp theme active.

3. Select “Point Count: Zoom to Address” from the Crime Tools drop-down menu.

4. Select the address(es) you would like displayed on the map.

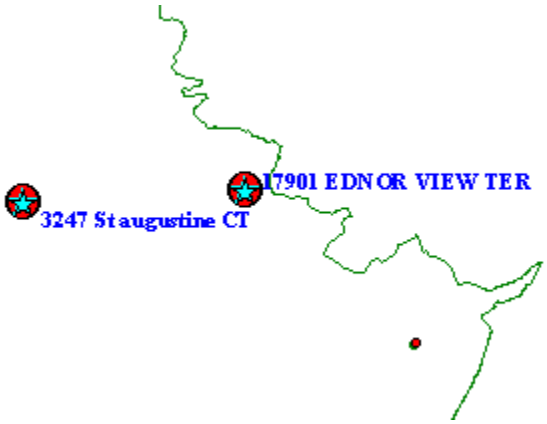


Details:

Once you have run a Point Count operation, the Zoom to Address will tool simplify the process of viewing and identifying those locations which have the highest numbers of incidents.

When the “pointcount.shp” theme created by the Point Count tool is the only active theme, the “Point Count: Zoom to Address” option in the Crime Tools menu will be available. When you select this option, the tool will determine which sites had the highest numbers of crimes, then provide you with a list of the addresses corresponding with those sites. Often these will be apartment or office buildings with the varying suite numbers; you will only be presented with the main address once. You may select a single address by either double-clicking on the value, or single-clicking it and then selecting the Okay button. If you would like to see the locations of several addresses, hold the shift key as you single-click each desired address with the left mouse button. Once you have selected all of the addresses you wish to see, click Okay.

The SCAS View will automatically zoom in or out as much as necessary to display the addresses selected. Each address will be marked by a star and its address will be shown as a text graphic. These graphics will turn on and off along with the Point Count theme, so you can hide them as necessary. If you delete the Point Count theme, the graphics will also be automatically deleted.



Labeling features on the map such as streets

1. Make the theme that you wish to label active.

2. Make sure that the correct field is set to create the labels by:

   Select Theme… Properties from the menu bar.

   Select 'Text Labels' on the left-hand icon list by clicking on it.

   Make sure the correct field is selected in the 'Label Field' drop down menu on the right.

   The correct field name will vary, depending upon the theme that you are trying to label. For street name labels or schools, the field name will be 'name'.

3. Select the 'label tool' from the tool bar. 

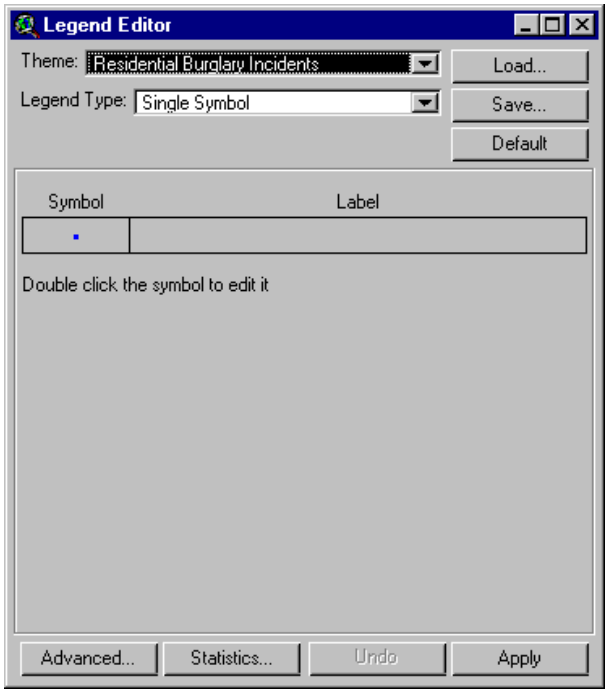
4. Click on each feature that you wish to label.

Changing the title of the map

To change an existing title or text Make sure that the layout containing the text that you wish to change is active. Select the pointer tool from the toolbar , double-click on the text that you wish to change. This will bring up the text-editing dialog box. Enter the new text as you wish it to appear, then hit the 'OK' button. The newly edited text will be replace the old text in the layout.

Customizing the symbols on the map

It is possible to customize the symbols representing features on the map in several ways: size, color, and symbol type. To change a themes symbol settings, double-click on the theme name in the table of contents. This will start the ArcView legend-editor window.



Double click the symbol to open the symbol palette manager which permits modifying polygon fills, line types, point symbols, text fonts, and colors. After you are done modifying symbols, click the 'Apply' button in the legend editor window to see how your changes appear on the map.

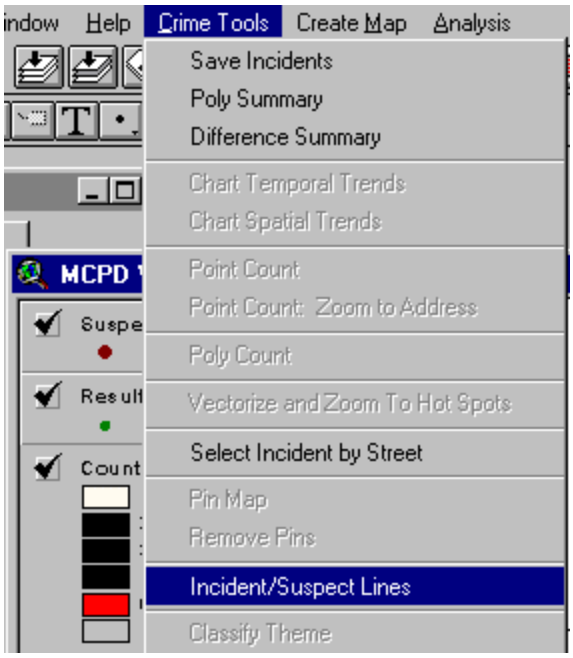
Linkage and Measurement Tools

Incident/Suspect Lines

Steps:

1. Make a Result and a Suspects theme active (they must be the only active themes)

2. Select Incident/Suspect Lines from the Crime Tools menu



Details:

This tool will draw lines between each suspect location and the incident to which it is related, and then label the line with the line length in feet. If the Suspect theme has a selected set, only those locations will have lines drawn. Note that if you zoom in or out of the view after you have created these lines/labels, you may need to shift the label locations or delete all of the lines/labels and re-create them at the new zoom level by re-running the tool. If you wish to only label a single line, or wish to draw a line/length-label for another pair of points not in the Result/Suspect themes, consider using the Length-Labeled Line tool.

Length-Labeled Lines

Steps:

1. Select the length-labeled line tool in the main SCAS view's tool bar. 

2. Click the starting point of your line on the view with the left mouse button and hold the mouse button down as you…

3. …move to the end point of your line and release the mouse button.

Details:
Note that if you zoom in or out of the view after you have created these lines/labels, you may need to shift the label locations or delete all of the lines/labels and re-create them at the new zoom level by re-running the tool.

Hot-Spot Analysis

Creating a 'hot-spot' map

The hot-spot tools are designed to work on an existing 'result' point set that has been previously created through a database query. The hot spot tools are used to analyze these result points, create a 3D surface of incident density, and then use the surface to create the hot-spots. So:

1. Make the "SCAS View" active.

2. Make a result point set the active theme in the view. Do this by clicking on the theme in the left-hand column (table of contents) of the view window. Active themes have a 3D rectangle around them in the table of contents.

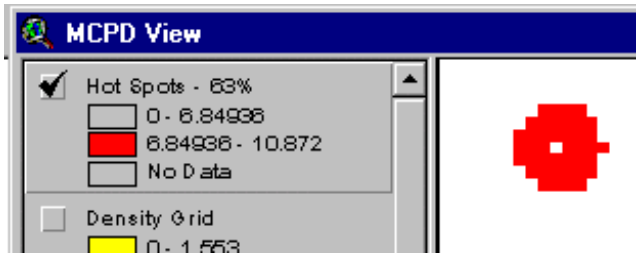
3. Click the 'Create Surface' button in the button bar. This will initiate the processing required to build the incident-density surface.

4. When the surface is created, make it the active theme. Click on the 'hot-spot slider' button. This will start the menu which allows you to refine the extent of the 'hot-spot' created.

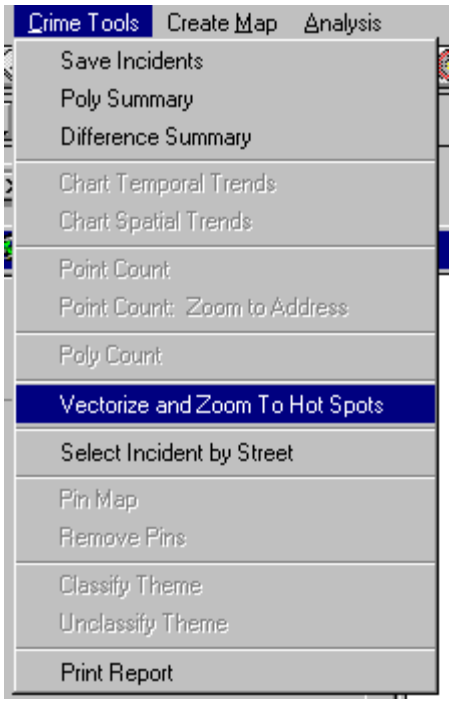
Vectorize and Zoom to Hotspots

Steps:

1. Make a Hot Spots theme active



2. Select the Vectorize and Zoom to Hot Spots option under the Crime Tools menu



3. A new theme will be created containing the polygonal features.

Details:

The Vectorize and Zoom to Hot Spots option will only be available if there is a single active theme containing a Hot Spots grid.

This tool will take the current hot spots theme (data stored as a grid) and convert the hot spots to polygon features (data stored as a shapefile) which may then be used in analysis with other shapefile-based features. After the conversion, the view will be automatically zoomed to show all of the hot spot polygons.

The purpose of this tool is to allow you use standard ArcView tools such as “Select By Theme” on your hotspots. Additionally, there is a SCAS tool, HotSpot SDEs, which will treat any incidents which fall within a hotspot as a cluster and generate Standard Deviation Ellipses for each cluster. You must run Vectorize and Zoom to Hot Spots before you can use the HotSpot SDEs tool.

Standard Deviation Ellipses

Steps:

1. Make a point theme (such as Result, Suspects, or Recovered Vehicles) active.

2. If desired, select any features from the theme

    a) use the ArcView Feature Select Tool 

b) use the query builder to select features 

3. Click the SDE button. 

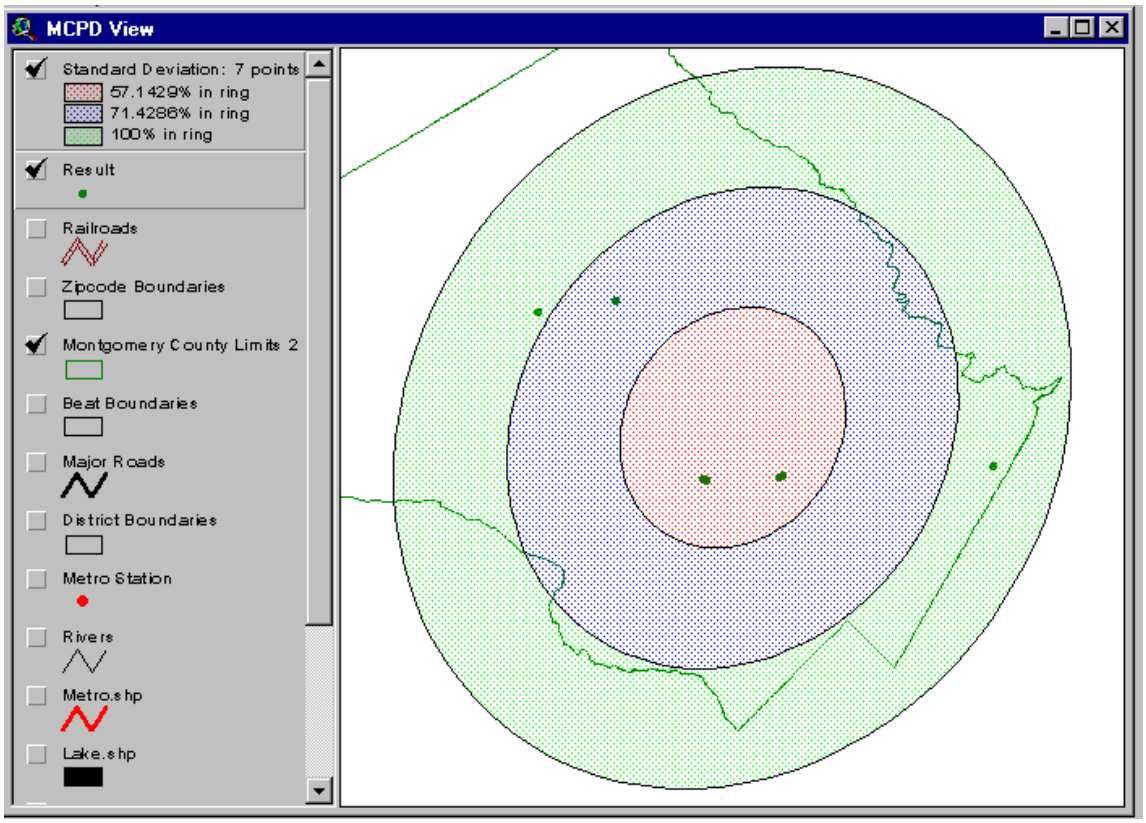
Details:

Standard Deviation Ellipses (SDEs) are a way of summarizing a distribution of points, showing not only the dispersion of the points, but also their orientation in space. SCAS can automatically generate standard deviation ellipses based on a set or subset of incidents.

To use the Standard Deviation Ellipse tool, first make a Result point theme the only active theme. If you'd like to limit the points used to generate the SDE, you 'll need to make a selection on the Result theme using the standard ArcView tools (e.g. the Select Features tool in the Tool Bar, or via the Query Builder on the theme's table). It is not necessary to have a subset of your Result theme, particularly if your Result theme was generated by a very specific query in the first place.

Next, simply select the SDE button in the tool bar. After a bit of processing, a new polygon theme, Standard Deviation, will be added to your view. This theme contains 3 elliptical polygons, one for each of the first 3 standard deviations of the distribution of points. Some additional quantitative information about the distribution is contained in the theme's legend. The title of the legend lists the number of points in the distribution. For each ring, the percentage of those points which lie within that number's standard deviation is presented. In the example below, the result theme consisted of a set of seven auto thefts. SDEs were generated for this distribution. 57% of the incidents occurred within one standard deviation of the center of the distribution – the red ellipse. 71% of the incidents were within two standard deviations of the center (the blue and red rings combined). And all of the incidents were within three standard deviations of the center of the distribution.

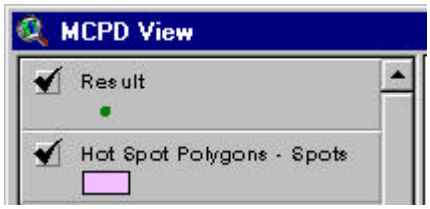
While a general rule of thumb that 67% of observations will be within the first standard deviation for a series of events (and 95% and 99% for the second and third respectively), it's important to remember that this rule is for a normal distribution; crime incidents will probably not be normally distributed, hence the variation in the percentage of incidents contained within each ring.



HotSpot SDE's

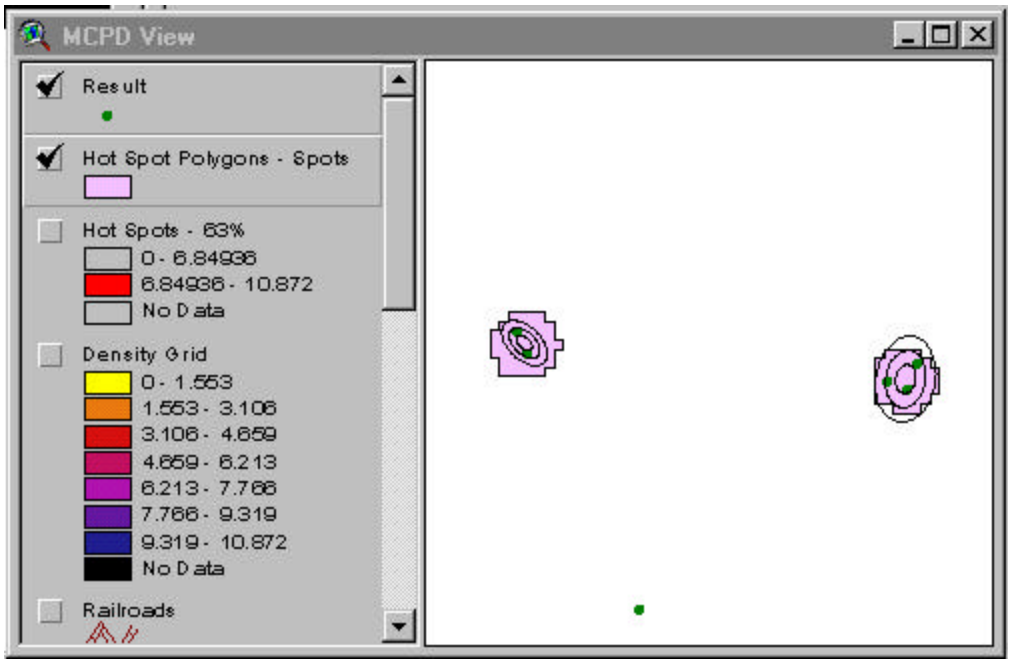
Steps:

1. Make your hot spot polygon theme (see "Vectorize and Zoom To Hot Spots") and the Result theme used to create the hotspots active.



2. Click the Hot Spot SDEs button. 

The SDEs will be drawn for each cluster of incidents.



Details:

The HotSpot SDEs tool requires that there be two active themes. One is a polygon theme containing the vectorized hot spots (see "Vectorize and Zoom to Hot Spots"), and the other is a point theme containing the incidents to map on the hotspots (typically a Result theme created by a custom query of the incident database).

The tool examines each individual hot spot to find any incidents in the selected Result theme which overlap that hotspot. The incident points which fall inside a single hot spot are considered a cluster. Three Standard Deviation Ellipses (see "Standard Deviation Ellipses") are then drawn around each cluster.

Currently, these SDEs exist only as graphics; they can not be used with the SDE Suspects tool.

Manual Geocoding

The manual geocoder is provided to permit the geocoding of records which failed to geocode automaticallly, or were ungeocoded with the geocode remover

To manually geocode an incident record:

1. Perform an incident query. The manual geocoder operates on the incidents which are in a 'Result' set.

2. Make the view GUI active.

3. Select the geocode tool from the tool bar. The manual geocode tool and the ungeocode tool share the same pull-down tool menu. The manual geocode tool is the flag without the cross-out.

4. A list of unmatched addresses will appear. Select one of the addresses from the list.

5. Point at a location on the map to assign a new coordinate to the selected address.

Geocode Remover

The Geocode Remover tool can be used to correct an incorrectly geocoded incident location. Incorrect geocodes can occur in several situations: invalid addresses entered for incidents, typos in the address or street number, errors in the street file used for geocoding, or misplaced manual geocodes.

The Geocode Remover tool works by removing all geocode information from a geocoded record, setting it to unmatched status. The record can then be manually re-geocoded using the manual geocoder tool.

To ungeocode a record:

1. Make the view GUI active.

2. Select the ungeocode tool from the toolbar. The ungeocode tool and manual geocode tool share the same pull-down tool menu. The ungeocode tool is the flag with the cross-out.

3. When the ungeocode tool is selected, you will be prompted for the CR number for the incident record that you wish to ungeocode. Enter the CR number. If more than one location is associated with the CR number entered, a list of the locations will be displayed. Choose one location from the list to ungeocode it.

- OR -

When the CR prompt appears, press cancel. The ungeocode tool will still be active. You may now ungeocode a point by pointing at the incident on the map that you wish to ungeocode. The tool will again display a list if there are multiple locations selected. Choose a location from the list to ungeocode it.

V. Creating Charts

Creating Temporal Trend Charts

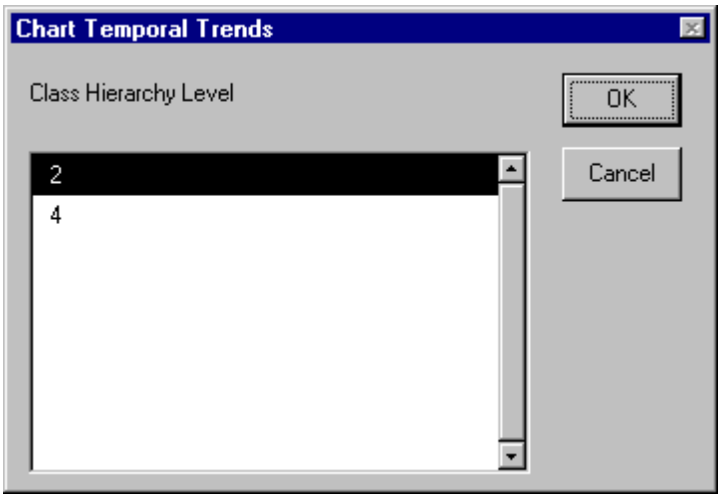
1. Make the 'SCAS View' the active window

2. Make a point theme active, i.e. Result

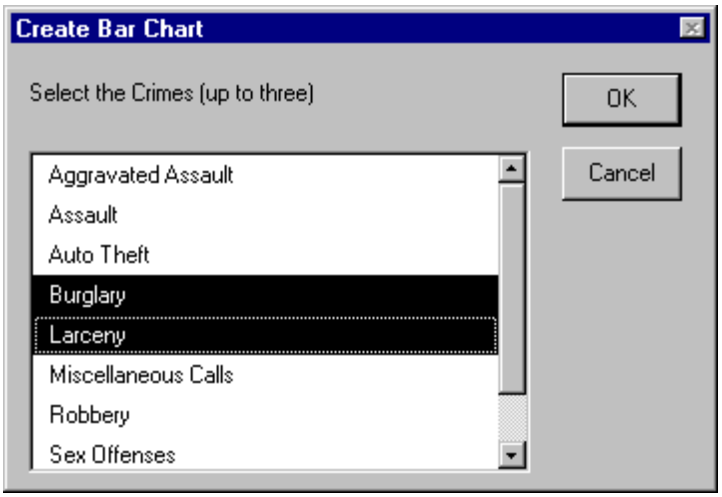
3. Select the points that you wish to create a time chart from.
   - If zero points are selected then a time chart will be created from all the incidents (geocoded and ungeocoded) in the active theme.

4. Select 'Chart Temporal Trends' from the 'Crime Tools' drop-down menu

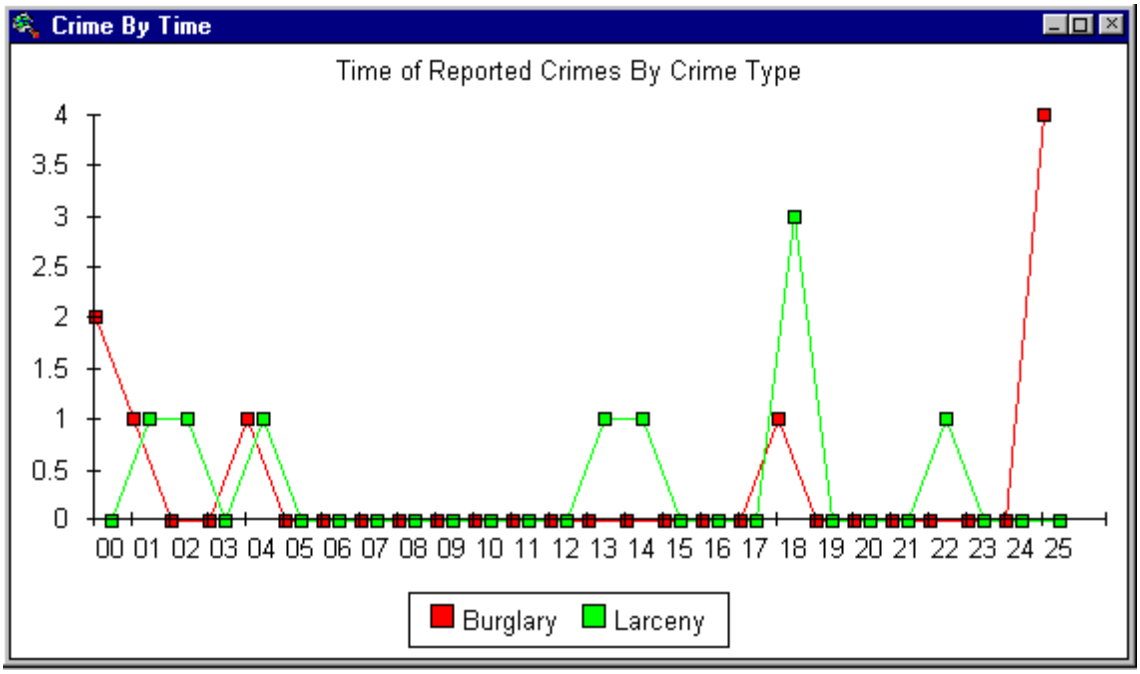
5. Select the hierarchical level.
   - Select (2) if you are interested in broad crime code classifications such as
     0400 - Aggravated Assault
     0500 - Burglaries
   - Select (4) if you are interested in the detailed crime code classifications such
     0511 - Burglary; Forcible Entry; Residential-Night (1800-0600)
     0411 - Aggravated Assault; Firearm; On Citizen



6. Select up to three crimes



7. The Time Chart is produced. The chart name is 'Crime By Time'. The table name is 'TimeClassChart'. Each crime code is a different color. The time is located along the X-axis. This chart shows there were two burglaries occurred at '00' - from midnight to 12:59 am. The 25th hour represents crimes in which the 'stime' was not entered into the database.



Create Spatial Trend Chart

1. Make the 'SCAS View' the active window

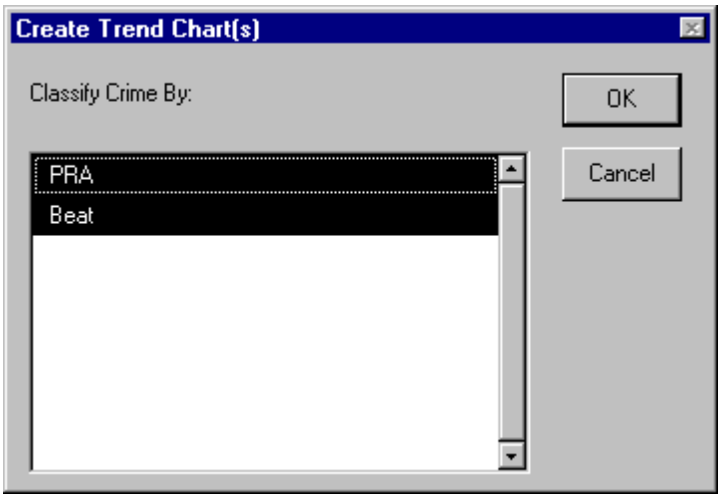
2. Make a point theme active, i.e. Result

3. Select the points that you wish to create a time chart from.

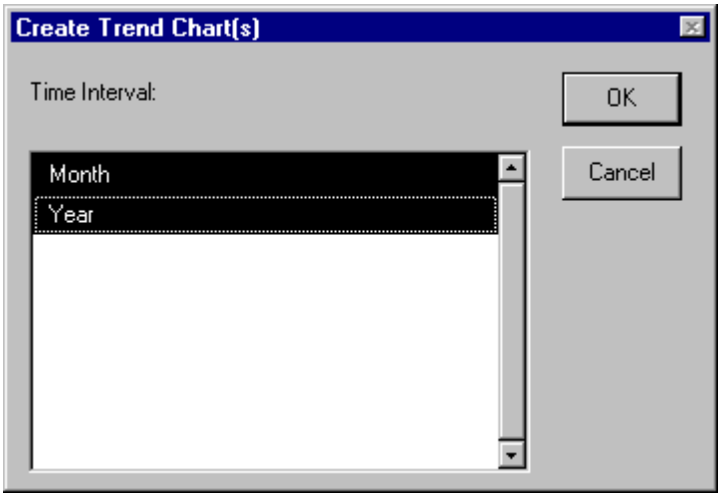
- If zero points are selected then a trend chart will be created from all the points in the active theme.

4. Select 'Chart Spatial Trends' from the 'Crime Tools' drop-down menu

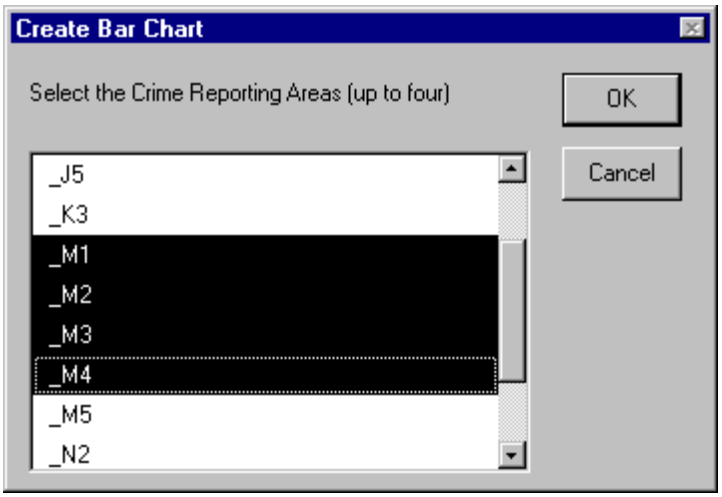
5. Select how you want to classify the incidents by PRA, Beat or both.



6. Select the time interval by Month, Year, or both.



7. Select the Crime Reporting Area(s) - Up to Four



8. The trend chart(s) are produced.

VI. Printing Maps and Reports

Printing a map

Make the layout or view the active document. Select 'Print' from the 'File' Menu. The print options dialog box will appear. Make sure that you have selected the correct printer, press 'OK' to send the map to the printer.

The print function always prints the active document, so if you wish to print the Layout (with titles, text, etc.), make sure that it is active before selecting the print option.

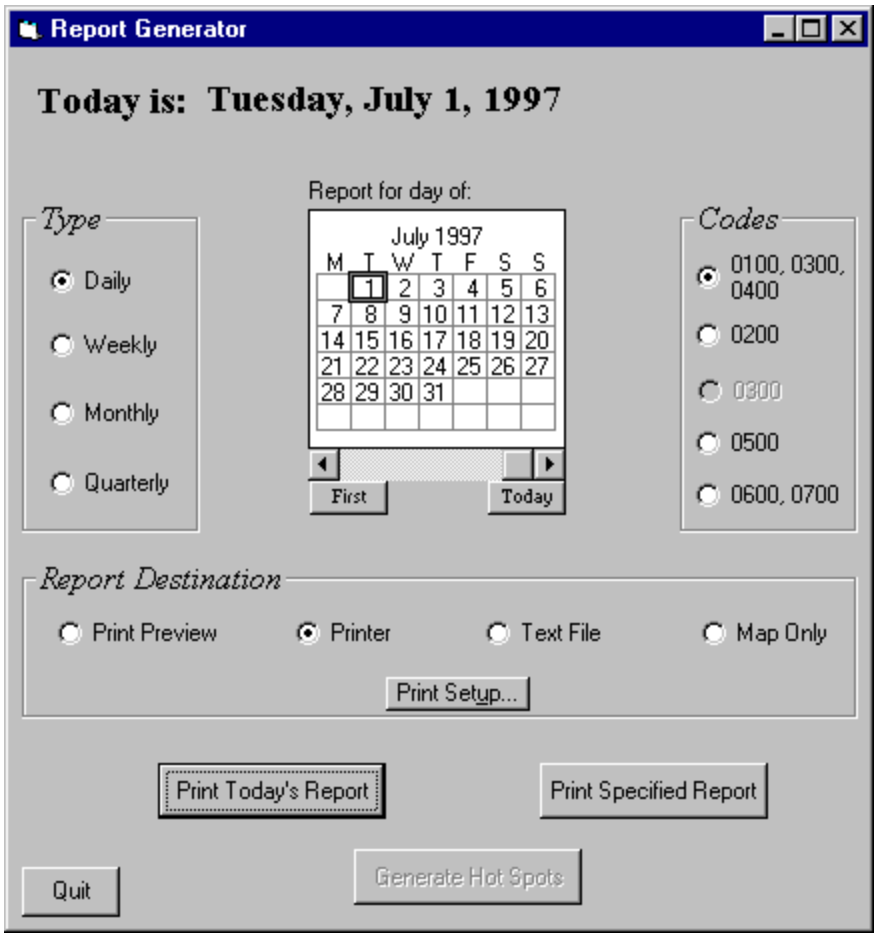
Standard Reports Generator

The SCAS Standard Report Generator is designed to automatically produce a standardized Daily/Weekly/Monthly map and matching report based on a simple checkbox form.

To produce a standardized Daily/Weekly/Monthly report:

1. Make the View GUI active. Click the 'D/W/M Reports' button. This will launch the Standard Report form menu.

2. Fill out the options on the form as follows:



Type:

Daily - Generates map and report for specified day.
Weekly - Generates map and report for specified week.
Monthly - Generates map and report for specified month.
Quarterly - Generates map and report for specified quarter.

Only one type of report can be selected at one time. The calendar / day selection option will change depending on the type of report chosen.

Codes:

Defines which types of incidents will be queried and mapped. Only one of the code buttons can be selected at a time. The 0300 code selection is only available for the Monthly and Quarterly reports.

Report Destination:

Only one destination can be chosen:

Print Preview: Prints the report to a preview window, which can then be canceled or sent to a printer.

Printer: Prints the report directly to the current default printer.

Text File: Prints the report to a text file. Will prompt for a filename.

Map Only: Does not create a report at all.

Use the 'Print Setup' button to set the default printer and modify printer settings.

To create the report, click one of the three buttons:

Print Today's Report - Prints the appropriate report based on the current date, as follows (This option ignores the date entry section of the Report Generator form):

Monday - Incidents entered from the previous Monday - Sunday.
Tuesday - Incidents entered on Monday.
Wednesday - Incidents entered on Tuesday.
Thursday - Incidents entered on Wednesday.
Friday - Incidents entered on Thursday.

Print Specified Report - Prints report as specified in the Report Generator Form

Generate Hot-Spots - This option is only available if Monthly or Quarterly report types are selected, and only for the 0300, 0500, and 0600-0700 Code types. This will perform the incident query as normal, but also will generate a incident density surface. The 'hot-spot slider' tool can then be used to refine the hot spot tolerance to generate a hot-spot map. A report is *not* generated for a hot-spot map.

Quit - This will exit the Report Generator. The report generator will remain active until the Quit button is selected.

Beat Reports

The beat report tool is designed to permit the selection of a single beat (or multiple contiguous beats) and produce a map of only the selected beat(s). All features outside the beat itself are clipped cookie-cutter style, and will not appear on the map. A ¼ mile radius is also drawn around the beat, and is used to ensure that incidents near the beat are also displayed.

To Produce a Beat Report:

1. Perform an incident query with the Primary Query Tool. If you know which beat you are interested in generating a beat report for, you can select it in the query now, though this is not required.

2. After the query finishes, make sure that the 'Result' theme is active and select the Beat Report Icon from the View window.

3. A selection box titled 'Which beat would you like to view?' will appear containing a list of all the beats which contain a returned incident.

4. Select a beat from the list (or multiple beats - hold the shift key while selecting the beats). If non-contiguous beats are selected, the Beat tool will exit with a warning. All beats selected must be contiguous for this tool to operate.

5. A beat map will then be produced for the selected beat(s). The resulting beat can then be used to create layouts as normal. On generating the layout, you will be prompted for a username and date range for creating a title for the map.

Creating Crime Alerts

The Crime Alert tool will allow the user to quickly generate a Microsoft Word document which contains both tabular information regarding a series of incidents and a graphic of a map showing the incidents. In addition, the Word document will have headers for sections of text which the Crime Analyst may fill in, as well as header information about the crime alert.

Steps:

1. Click the Crime Alert button. 

2. The crime alert menu, as seen below, will appear.

3. Select the features of the current result set which you would like to export. For instance, suppose you've performed a query and 5 of the incidents which were returned need to be placed on to a crime alert. Make the Result theme active and use the ArcView feature select tool to highlight those five incident points.

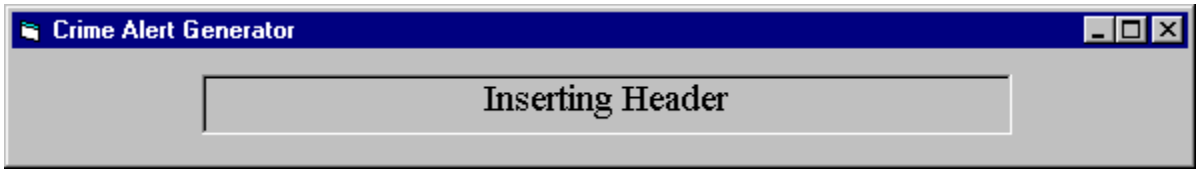
You may also open a table for the theme and select your incidents in that manner. Or, if you would like all of the incidents in the Result theme to appear on the crime alert (for instance, if you've used the Select By CR option), you may leave all of the features unselected. When ready, click "Export Data" on the crime alert menu.

4. Prepare the map that you would like to appear in your crime alert. The map may be either a view or a layout. If you choose to make a layout, you can use the standard SCAS layout

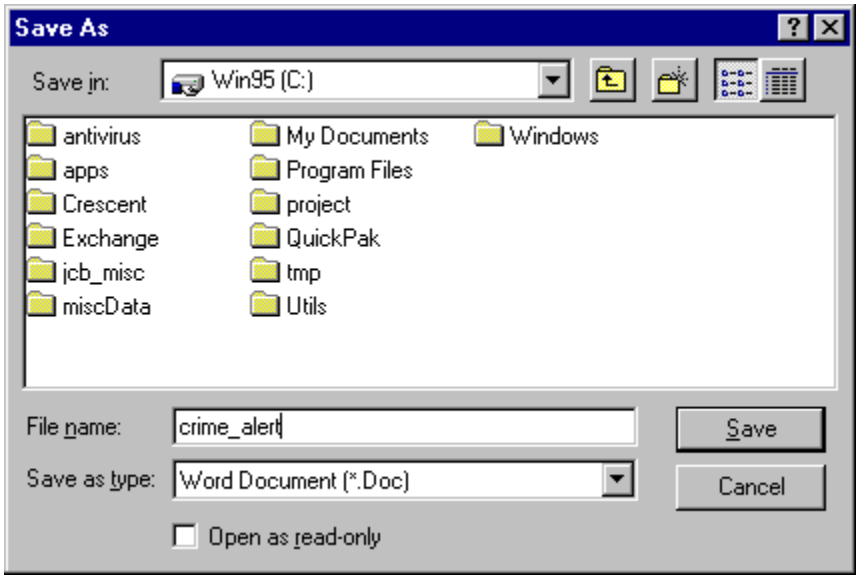
generator, or create custom layouts. Your map may contain whichever themes you would like, may have labeled roads, etc. Once you have your map completed, make the View or Layout window active, then click the "Commit Map" button in the crime alert menu.

5. You may now create the crime alert at any time by clicking the "Create Crime Alert" button.

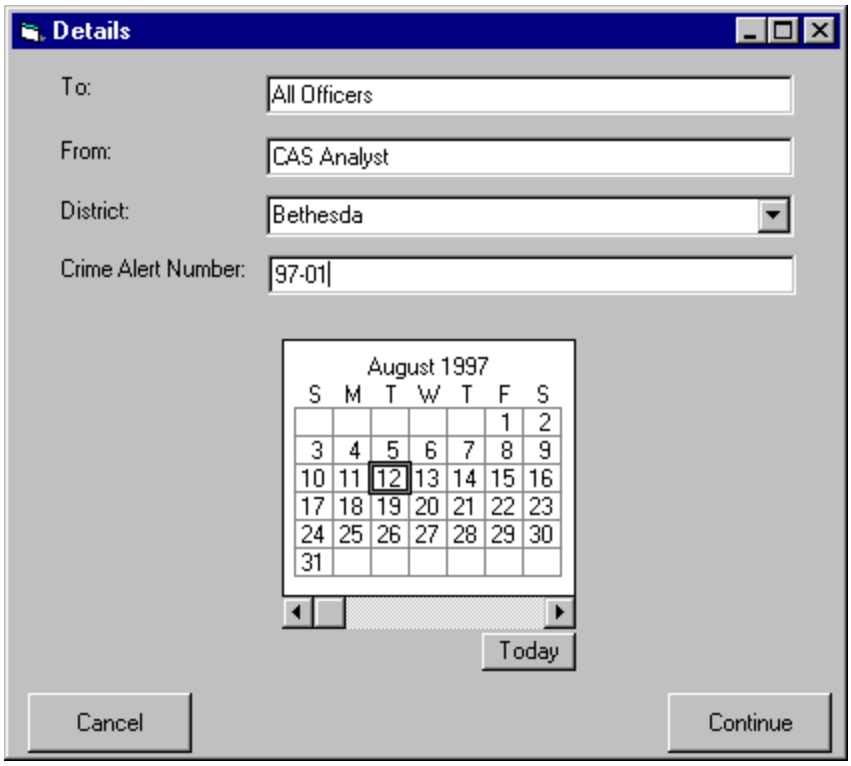
6. Once you have started to create the crime alert, Word will be started if it is not already running, and a status window will appear at the bottom of the screen. This window will be updated along the course of the document creation.



7. The software will ask you to enter a filename for the new document. You must specify a new filename; you may not re-use an old name. You may save the crime alert in any directory. If you do not specify the extension ".doc" it will be added.



8. After a bit of processing, the software will ask you to enter some information for the crime alert.



The “To“ field is for the recipients of the crime alert. “All Officers” is the default value, but may be changed as appropriate.

The “From” field should specify the author of the crime alert. The default value is simply “CAS Analyst”.

The “District” field contains the source area of the crime alert. You may select any of the 5 districts by selecting the district name from the drop down menu, or you may type in a new value. If you select one of the district names, the word “District” will be appended in the crime alert header.

The calendar widget allows the user to specify a date for the origination of the crime alert. The calendar is automatically set to the current date, but may be changed if necessary.

Select “Continue” when all of these fields have been completed.

9. At this point, crime alert will create a new Word document, create a header, build a table populated with the information for the incidents selected, import the map as a graphic, and save the new file. Finally, the Microsoft Word window is opened.

10. When the automated portion of the document is done, the user must still fill in the narrative portions of the crime alert. Additional editing of the table or image may also be done, including modification of the font or cell sizes of the table, and scaling or rotation of the image.

Details:

The crime alert tool has been designed with maximum flexibility in mind. Data and images may be exported from SCAS at any time, and the user does not need to immediately complete the crime alert. If you try to create a crime alert without first exporting a new incident set or map graphic, you will be warned, but allowed to continue.

The map-making process is as flexible as possible. You are not required to include any features in the map. For instance, you may wish to not even include the result theme from which you exported your data, instead using custom shapefiles to depict your points. View or layouts may be used, so the map can be as simple or complex as you would like. You may even create complex maps such as "Beat Maps" and export these for your crime alert.

Any text within the created document may be edited. The tables can be manipulated. Hard page breaks may be removed to make the crime alert fit on fewer than 3 pages.

VII. Managing your work

Saving changes to a project

You can save your project any time during the ArcView session by selecting 'Save' from the 'File' menu. To give the project a new filename, activate the project window and select 'Save As…' from the file menu. The 'Save as…' option is only available when the project window is active. The file save dialog box will appear and allow you assign a new name and location to the project file.

VIII. Glossary

Active - When a theme is active it is highlighted in the Table of Contents. To make a theme active, click on it in the Table of Contents. To make more than one theme active, hold down the SHIFT key when you click the themes. Many of the operations that you can perform on a view work on the active theme(s), so making a theme active is the first step in many ArcView procedures.

Definition courtesy ESRI ArcView Users Guide.

ArcView - ArcView is a desktop based Geographic Information System (GIS) developed by Environmental Systems Research Institute (ESRI).

Avenue - The programming language used to customize the ArcView environment. Most of the Spatial Crime Analysis System was written in ArcView.

Change Map - Map which reflects the change in the number of incidents by comparing the numbers of incidents in areas for two different time periods. For example, the numbers of incidents for January 1994 could be compared to January 1995. The resulting map will summarize the differences by polygons such as PRA or beat, and create a map.

Custom Query - The Spatial Crime Analysis System function which permits designing a custom database query to pass to the incident database. This is achieved through the custom query form menu, and several custom programs.

Difference Map - See Change Map

Document - Documents are the way that ArcView manages the user interface environment. Views, Layouts, Tables and Scripts are all types of documents.

ESRI - Environmental Research Systems Institute. The GIS software company that makes ArcView and other GIS software such as ArcInfo and ArcCad.

Geocoding - The process of assigning a coordinate (such as Latitude/Longitude) to an address. This permits mapping database records which contain addresses and is the key to all of the mapping functions of SCAS.

GIS - Geographic Information Systems. GIS is a relatively new technology which uses computers to perform geographic database analysis. GIS analysis is used in a wide variety of fields which need to address the question of *where?* such as urban planning, forestry, military, and crime analysis. GIS systems are full-features applications that combine database management with map production.

Graduated Symbol - A cartographic technique which increases or decreases a symbol's size based on the value of the information that it represents. For example, if a symbol is being used to represent population by county on a map, a larger symbol will represent counties with greater populations, while smaller symbols will be placed on counties with low populations. SCAS has a graduated symbol option on the point count tool.

GUI - GUI stands for 'Graphical User Interface', and is often pronounced 'gooey'. GUI refers to the graphical, point and click user interface common to today's windows-based applications.

Hot-Spot - Hot-Spot analysis refers to the technique in crime analysis of defining clusters of high concentrations of incidents. SCAS provides several tools for performing hot-spot analysis, including surface-generated hot-spots and Standard Deviation Ellipses.

Incidents - Incident refers to each record in the SCAS incident database.

Layout - The ArcView document used for map design and printing. The layout document permits adding view documents, text, titles, north arrows and other features required to develop a print/publication quality map.

ODBC - Open DataBase Connectivity. A database communication standard which allows applications to communicate with disparate databases using a standard query language (SQL). The Spatial Crime Analysis System communicates with the SCAS Crime Analysis database in Access through ODBC.

Pin Map - A simple map where a dot or symbol on the map represents an incident. This is the basic incident map produced by SCAS. Pin maps have the disadvantage of not being able to distinguish multiple points at the same site. See graduated symbol for a way to deal with that problem. SCAS also has a tool which will turn the standard point symbol (a dot) into an actual 3-D appearing 'pin' symbol with a shadow. This function is available under the View menu 'Crime Tools' and is called 'Pin Map' and 'Remove Pins'.

Project - ArcView stores all customizations and files associated with an ArcView session in 'project' files. For example, if you open several databases, customize a view, and build a layout, you can save all your changes by saving them to a project file.

Query - Queries are used to select subsets of records from databases. The Spatial Crime Analysis System is designed to make querying the SCAS database relatively simple. A query menu has been developed which allows point and click preparation of a query to the incident database.

Report - A report is a printout of the information stored in a table. The Spatial Crime Analysis System will automatically generate a report with each map that contains the results of a database query.

SCAS - Spatial Crime Analysis System. See What is the Spatial Crime Analysis System

SCAS View - The View in which all SCAS themes and layers are available, and where all SCAS geographic analysis occurs.

SQL - Structured Query Language. A standard query language used to query and manipulate databases.

Spatial Trend Chart - Creates a bar chart showing the number of incidents by reporting area (PRAs, Beats) in increments of months and/or years for all points or a selected number of points in a theme.

Standard Deviational Ellipse - See detailed description of SDE.

Temporal Trend Charts Creates a line chart showing the number of incidents by crime types in increments of one hour for all points or a selected number of points in a theme.

Theme - ArcView manages separate geographic layers as 'themes'. In the SCAS view, there are several themes, among them streets, PRA's, metro lines, schools, etc. Themes can be added and removed from views, and turned on and off.

Tool - ArcView provides several tools for manipulating a view or map. The tool bar will activate the mouse pointer and wait for you to perform some operation on the map or layout.

View - Views are the ArcView documents for managing all geographic themes, and performing all geographic analysis.

Visual Basic - A programming environment developed by Microsoft Corporation. Visual Basic was used to develop many of the user interface forms for the Spatial Crime Analysis System.